General

Guideline Title

Multisociety consensus quality improvement guidelines for intraarterial catheter-directed treatment of acute ischemic stroke from the American Society of Neuroradiology, Canadian Interventional Radiology Association, Cardiovascular and Interventional Radiology Society of Europe, Society for Cardiac Angiography and Interventions, Society of Interventional Radiology, Society of NeuroInterventional Surgery, European Society of Minimally Invasive Neurological Therapy, Society of Vascular and Interventional Neurology.

Bibliographic Source(s)

Sacks D, Black CM, Cognard C, Connors JJ III, Frei D, Gupta R, Jovin TG, Kluck B, Meyers PM, Murphy KJ, Ramee S, RÃ¼fenacht DA, Stallmeyer MJB, Vorwerk D, American Society of Neuroradiology, Canadian Interventional Radiology Association, Cardiovascular and Interventional Radiological Society of Europe, Society for Cardiovascular Angiography and Interventions, Society of Interventional Radiology, Society of NeuroInterventional Surgery, European Society of Minimally Invasive Neurological Therapy, Society of Vascular and Interventional Neurology. Multisociety consensus quality improvement guidelines for intraarterial catheter-directed treatment of acute ischemic stroke, from the American Society of Neuroradiology, Canadian Interventional Radiology Association, Cardiovascular and Interventional Radiological Society of Europe, Society for Cardiovascular Angiography and Interventions, Society of Interventional Radiology, Society of NeuroInterventional Surgery, European Society of Minimally Invasive Neurological Therapy, and Society of Vascular and Interventional Neurology. J Vasc Interv Radiol. 2013 Feb;24(2):151-63. [142 references] PubMed

Guideline Status

This is the current release of the guideline.

Recommendations

Major Recommendations

Data Collection

Unlike many other areas of quality assurance/morbidity and mortality that concentrate on specific anecdotal events—typically errors in care or complications—the endovascular treatment of stroke must have a minimum level of positive outcomes to be clinically beneficial. The measure of benefit from endovascular stroke therapy is not based on single or isolated cases; it is rather expressed as a percentage of patients treated who can function independently by 3 months after the intervention. This requires entering all patients and their procedural, process, and clinical outcomes into a database, trial, or registry. Without the denominator of "all patients," success measures/percentages are meaningless. These data allow comparison against benchmarks for individual procedural performance, risk-adjusted clinical outcomes, and individual and institutional process measures. As stated in an earlier document concerning comprehensive stroke centers, it is advantageous to collect data in a standardized fashion to avoid redundant efforts. Examples of such data collection tools for treatment of acute ischemic stroke may include the Interventional Stroke Therapy Outcomes Registry (INSTOR) and Get with the Guidelines–Stroke. The mandatory threshold for collection of the defined elements is 100%.

Data concerning demographics are used to identify various patient subgroups, whereas other data points are pertinent for risk adjustment and are necessary for evaluation of procedural and clinical outcomes. These would include factors specific to the individual case (e.g., location of occlusion, time from onset) or factors specific to patient subgroups (e.g., age, sex). Collection of these data points is necessary for an appropriate evaluation of patient risk factors and also for study of institutional factors that could influence overall patient outcomes and therefore have a bearing on evaluation of operator performance.

At a minimum, these data should include age, sex, race, National Institute of Health Stroke Scale (NIHSS), location of occlusion, various time points and intervals described later, blood pressure, presence or absence of diabetes, presence or absence of atrial fibrillation, and type of occlusion (embolic versus atherosclerotic). Other data elements may be helpful and may become evident with further research.

Time Intervals

Emergency endovascular stroke treatment is one of the most complex multidisciplinary functions a medical institution chooses to undertake. Reperfusion treatment (intravenous [IV] or endovascular) achieved within the shortest period of time is widely accepted as a prerequisite for optimal clinical outcomes. It is estimated that, for every 30-minute delay in time to revascularization, there is a 10% decrease in the likelihood of a good outcome from endovascular stroke therapy. There are many steps from stroke onset to completion of treatment, and optimal execution of each of these steps is necessary to achieve the stated goal. Numerous opportunities exist to minimize the time needed for each step from the time of the acute stroke to patient arrival to the hospital and then until reperfusion is achieved.

Process improvement for emergency stroke treatment should be an ongoing component of all stroke systems of care and should focus on all the tasks and activities in this complex sequence of events. These data are then used for quality assessment/assurance and process improvement, and thus directly relate to the eventual clinical outcome of the patients being treated by the operator. To judge satisfaction of these performance goals in regard to expeditious delivery of care, time points and intervals are the units of measurement.

At a minimum, all time points and intervals specified in the original guideline document should be tracked in all cases. Institutions may choose to measure additional time points. The more time points that are recorded, the more exactly deficiencies might be identified. For instance, delays in obtaining a computed tomography (CT) scan may result from delay in ordering the study, delay in response by CT staff (e.g., because of multiple other procedures being requested at the same time), or delay caused by transportation.

Acknowledgment of the critical importance of time to reperfusion for obtaining favorable outcomes in myocardial reperfusion treatments has led to the formation of initiatives such as Door to Balloon (D2B): An Alliance for Quality, an international effort organized by the American College of Cardiology in partnership with the American Heart Association and 37 other organizations to rapidly translate research about how best to achieve outstanding D2B times for patients with ST-segment elevation myocardial infarction (MI). The key metrics recommended by this initiative, which has enrolled more than 1,000 hospitals, were achievement of a D2B time of less than 90 minutes for at least 75% of patients presenting directly to the treating hospital. Key strategies chosen by the D2B Alliance include having the emergency medicine physician activate the catheterization laboratory with a single call, having the team prepared within 20 to 30 minutes of the call, rapid data feedback, a team-based approach, and administrative support. Such initiatives have resulted in dramatic reductions in the times required from presentation to the hospital to procedure initiation. A recent study found that D2B times have decreased nationally from a median of 96 minutes in 2005 to a median of 64 minutes in 2010.

The impressive results in shortening the time to myocardial reperfusion for acute MI obtained by such initiatives provided an impetus for launching similar initiatives related to IV tissue plasminogen activator (tPA) for stroke. Target Stroke is a national initiative that has hitherto enrolled more than 1,200 hospitals in the United States. It is organized by the American Heart Association/American Stroke Association in partnership with other organizations and aims to assist hospitals in increasing the proportion of IV tPA-treated patients in whom guideline-recommended door-to-needle times are achieved. The initial goal is to achieve a door-to-needle time no more than 60 minutes for at least 50% of patients with acute ischemic stroke. The Joint Commission has set a more ambitious goal of 80% of patients treated within 1 hour at primary stroke centers. The 10 key strategies chosen by Target: Stroke include emergency medical service prenotification, activating the stroke team with a single call, rapid acquisition and interpretation of brain imaging, use of specific protocols and tools, premixing tPA, a team-based approach, and rapid data feedback. Many of these strategies apply to the endovascular approach for stroke as well.

The realities of endovascular stroke practice have yet to achieve the level of refinement that the acute MI process has realized by implementation of guidelines. One study reported a mean time of 174 minutes ± 60 from noncontrast head CT to microcatheter placement in the thrombus of patients with acute stroke caused by large vessel intracranial occlusions across three academic centers performing endovascular acute stroke treatment in the United States. This report does not contain detailed breakdown of times required for each step, for example, from CT to additional imaging (if performed), transportation to the angiography suite, general anesthesia, and groin puncture to microcatheter insertion. Another study described a more detailed analysis of these steps in a group of patients with acute stroke selected with magnetic resonance (MR) imaging and treated with endovascular therapy at a single center in Europe. In this report, the mean time to MR imaging was 59 minutes, the mean MR imaging duration was 22 minutes, the mean time from MR imaging to groin puncture was 81 minutes, and the mean time from groin puncture to reperfusion was 54

minutes. Adding all these times would yield mean times of 162 minutes from door to groin puncture and 216 minutes from door to reperfusion. Similar times can be derived from recommendations regarding initiation of intraarterial (IA) therapy (groin puncture) set forth by the Interventional Management of Stroke III executive committee suggesting that groin puncture should occur within 90 minutes of starting IV therapy. In combination with a door–to–IV tPA time of 60 minutes, this would lead to a door-to-puncture time of as long as 150 minutes for combined IV/IA therapy.

As a result of the need for imaging and, in many places, anesthesia services in addition to the emergency medicine and interventional components, patients with acute stroke referred for endovascular therapy require at least an additional 1 hour compared with acute MI (and, in some hospitals, closer to 2 hours) for initiation of treatment. Although rapid response mechanisms aiming to result in initiation of revascularization therapies within the minimum amount of time can be modeled according to the MI experience, it should be recognized that acute stroke treatment, especially endovascular therapy, requires a far more complex infrastructure. Notwithstanding that, it is clear that, similar to the cardiology model, major improvements in door-to-treatment times need to take place to increase the proportion of favorable outcomes for patients treated with endovascular therapy for acute stroke.

Key Time Intervals

The time-interval metrics should be applicable regardless of the time of day and regardless of whether the patient presents on a weekday versus a weekend. These metrics represent maximum recommended times. Because of ample evidence that, the shorter the time to reperfusion, the higher the likelihood of a favorable outcome, all centers should strive to initiate endovascular therapy within the shortest possible time frame. Although IV tPA administration should not represent a justification for excessive delays in initiation of endovascular therapy, IV thrombolysis may be associated with some delays in initiation of endovascular therapy.

Door to Imaging

Most hospitals will use a noncontrast CT, but some hospital protocols may use MR imaging as the first imaging study. This study should be performed within 25 minutes and interpreted within 45 minutes. The present original guideline document also requires that the interpretation must be sufficient to make decisions for patient care and the interpretation and time of interpretation be documented in the medical record. Because of the difficulty in defining exactly when an order might have been given, the original guideline is in agreement with the American Stroke Association recommendations that these time intervals be measured from arrival to start of imaging rather than from time of order to completion of imaging.

Use of CT Angiography/Perfusion or MR Imaging/Angiography (for Centers that Perform MR Imaging) as First-step Imaging

Randomized trials of IV and IA stroke revascularization have selected patients based on noncontrast head CT. Currently, no randomized trials confirm the superiority of advanced imaging (CT angiography/perfusion or MR imaging/angiography) as a selection tool for endovascular therapy versus plain CT alone. However, previously published guidelines on imaging in patients with acute stroke recommend that noninvasive vascular imaging be routinely performed. Such imaging must not unduly delay therapy with IV tPA or delay time from door to arterial puncture beyond 2 hours (as detailed further later).

Door to Puncture

The majority of time from door to revascularization comes from the steps from door to puncture, rather than from puncture to revascularization. Therefore, the largest opportunities to reduce delays and improve outcomes will come from reducing door-to-puncture times. Regardless of clinical evaluation and imaging details, the recommended time from patient arrival to start of procedure (arterial puncture) is 2 hours or less. This is more rapid than reported in previous trials, but it is the consensus of the writing group that this time metrics are necessary and achievable, and consistent with the improvement in D2B times that have been achieved for acute MI.

Puncture Time to Start of Revascularization

The start of revascularization is defined as the start of IA infusion of a thrombolytic drug or the first pass of a recanalization device.

Puncture Time to Revascularization

These metrics of time from puncture to revascularization assess the efficiency of the interventional physician and team. Given the rapid advancements in endovascular treatment modalities, these recommendations are likely to change. In the Mechanical Embolus Removal in Cerebral Ischemia registry, the largest prospective endovascular database to date reflecting procedural outcomes across a large variety of stroke centers in the United States, the median time from groin puncture to end of procedure was 90 minutes. Newer technologies such as stentrievers have been noted to achieve significantly shorter procedural times (median of approximately 50 min). Although the time to final angiography is easily measured, it may be variable depending on the need to perform thrombolysis of peripheral branch occlusions after recanalization of the proximal occlusion. For this reason, puncture time to initial revascularization to thrombolysis in myocardial infarction (TIMI) grade 2 or thrombolysis in cerebral

infarction (TICI) grade 2a was chosen as a metric. Although this is not proven, it is the consensus of the writing group that more complete revascularization is likely to lead to improved clinical outcomes, albeit at some increased procedural risk, and therefore TICI grade 2a reperfusion may not be the intended endpoint of revascularization. It is possible that further time will be necessary to achieve more complete revascularization.

Recanalization/Reperfusion

Recanalization and reperfusion are not necessarily the same, but both are measures of revascularization. Recanalization typically pertains to the original occlusion site whereas reperfusion pertains to the distal capillary bed. Endovascular methods of recanalizing vessels have been studied for more than 30 years. Numerous trials and series have demonstrated efficacy and clinical benefit for recanalization of cerebral vessels for acute ischemic stroke. Incomplete recanalization may lead to reocclusion, with clinical deterioration. Recanalization is a measure of technical success and thought to be a surrogate for subsequent clinical benefit, and has been accepted as such by the Food and Drug Administration. Recanalization of the occluded vessel has been achieved in 70% to 89% of patients by using mechanical devices in large series, but this high rate may not correspond to effective reperfusion of the vascular bed. Recanalization rates in the middle cerebral artery from thrombolysis alone average 65%. Recanalization/reperfusion rates can be affected by clot source, location, and size, with higher rates of failed recanalization and poor clinical outcomes for larger and/or more proximal occlusions (e.g., carotid T-lesions).

There are several methods to measure recanalization, including arterial occlusive lesion, TIMI, thrombolysis in brain ischemia, and TICI (see Table 1 in the original guideline document). Several studies and series have used these various means to describe recanalization rates. Simplistic evaluations of recanalization of the major vascular occlusion (e.g., arterial occlusive lesion) are thought to be less informative than data concerning reperfusion of the entire vascular bed. Under the heading of "TIMI Scale," recent stroke clinical trials have actually used very different brain-adapted versions, hampering comparisons and understanding of trial findings. The TICI scale is a commonly used revascularization measure that was developed in 2003 in an effort to standardize reporting of revascularization efforts and scores range from 0 (i.e., total occlusion) to 3 (i.e., completely normal angiogram). TICI is currently used in the Interventional Management of Stroke trial and in the ongoing stroke registry INSTOR. For the purposes of the present original guideline document, TIMI or TICI is suitable for evaluating the success of recanalization at the end of the procedure.

The metric for revascularization includes all clot locations (in anterior and posterior circulations) and is therefore lower than the reported rates for middle cerebral artery occlusions alone. As technology and performance improve, the threshold for recanalization may increase. The ultimate goal of revascularization is to improve patient outcomes. However, there is a risk that persistent attempts to recanalize an occlusion may lead to more complications. The combined metrics for symptomatic intracerebral hemorrhage (SICH), recanalization, and modified Rankin Scale (mRS) score of 0–2 measure these risks and benefits.

Postprocedure CT/MR

Certain vital information concerning procedural success or failure requires postprocedure cross-sectional imaging, and this is typically done 24 to 36 hours after finishing the case. Postprocedure imaging is necessary to identify acute subarachnoid hemorrhage, intraparenchymal hemorrhage or contrast staining, parenchymal hematoma, overall extent of new stroke, and other findings. CT or MR imaging within 36 hours after the intervention should be performed in all stroke cases. Although some patients may receive CT or MR imaging immediately after the procedure, imaging performed the next day provides additional valuable information. It is recognized that there are certain circumstances that might render follow-up imaging difficult or impossible to perform. Therefore, the threshold for this imaging is 90%, with the expectation that a goal of 100% is desired.

Symptomatic Intracerebral Hemorrhage (SICH)

The most common major risk of endovascular treatment of acute ischemic stroke is SICH. The reported incidences of SICH (as defined by individual studies) following IA revascularization range from 5% to 12%, with an average of approximately 10% in a metaanalysis of randomized trials. Several definitions have been used, starting with the National Institute of Neurological Disorders and Stroke trial and in the Safe Implementation of Thrombolysis in Stroke Monitoring Study (SITS-MOST) and INSTOR registries. The definition chosen for this metric is based on that used by SITS-MOST, and is parenchymal hematoma type II or subarachnoid hemorrhage with neurologic deterioration leading to an increase in NIHSS >4 or leading to death within 36 hours of treatment (see Table 2 in the original guideline document). SICH is not only an "end-result" evaluation of clinical judgment in the realm of patient selection and technical skill, but also a reflection of timing, procedural execution, and expeditious completion of task. For these reasons, tracking SICH is mandatory.

Subarachnoid hemorrhage is a unique complication of endovascular therapy, and is not typically seen with IV therapy with tPA alone. Intraprocedural subarachnoid hemorrhage can be rapidly fatal and is typically technique-related, and is therefore an entity that deserves special scrutiny. Although it is reported infrequently in the Interventional Management of Stroke trial and thought to result from wire perforation, it may be more likely to occur with mechanical clot retriever use and/or rescue angioplasty.

Clinical Outcomes

See the original guideline document for information on clinical outcomes.

Death within 72 Hours of Treatment

Death within 72 hours of stroke is typically not a result of the stroke itself. The authors clearly acknowledge that every case is unique and that each instance needs to be reviewed in its entirety with the understanding that there are circumstances (e.g., MI) that lead to death in the short term and are unrelated to operator factors. Death soon after a procedure in and of itself does not imply or indicate a quality problem. However, all deaths within 72 hours are a trigger for review and should be subject to immediate or focused inquiry. The threshold for death within 72 hours is 0%.

Quality Improvement

Ongoing Quality Improvement

As IA treatment of acute ischemic stroke becomes a mainstream offering at many centers, an IA-specific multidisciplinary quality improvement process should be established in all programs that offer IA treatment options. These endovascular cases and procedural techniques are innovative and can offer improved clinical outcomes, but should be monitored in a continuous and ongoing fashion.

A peer-review committee should be formed that involves personnel from the several backgrounds that have expertise in stroke care and a vested interest in quality of care and good outcomes. This committee should provide an open and transparent forum for process and case review. Transparency will optimize confidence in the process and its positive impact on patient care. Although there may be potential for conflict or disagreement among various participants, it is vital that the process be viewed as a nonpolitical, nonpunitive instrument for care process improvement.

In keeping with standards established under the Health Care Quality Improvement Act of 1986, peer-review meetings and minutes are generally protected from legal inquiry in most states as long as the review is conducted under the auspices of the facility quality improvement program. The Health Care Quality Improvement Act established standards for professional review actions. If a professional review body meets these standards, neither the professional review body nor any person acting as a member or staff to the body will be liable in damages under most federal or state laws with respect to the action. All associated quality improvement documents should include routine annotation, which establishes the purpose of the document and that its content is protected under applicable federal or state law. The program should operate under the local facility umbrella established for all facility quality improvement and peer-review initiatives.

Peer Review Team

It is recommended that under the oversight of the stroke team medical director a predetermined multidisciplinary subgroup consisting of medical personnel with familiarity and expertise in IA therapy be established to address issues specifically relating to IA treatment. Although a stroke neurologist is generally in the best overall position to objectively assess overall process deficiencies and outcomes, for technical and procedural issues, the interventionist's perspective must be considered. Care should be taken to avoid the inclusion of bias or review by individuals who are not familiar with the technical aspects of IA revascularization and its related potential complications. Ideally, the IA oversight team should be directed by a highly qualified, observant, compassionate, prompt, and unbiased physician, such as a noninterventional vascular neurologist. Depending on the institution, the IA quality improvement peer group could include a variable combination of interventionists, vascular neurologists, cerebrovascular neurosurgeons, intensivists, and diagnostic neuroradiologists. Additional members might include hospital representative(s) from the quality assurance/improvement or risk management departments as well as possibly the stroke coordinator or other data personnel and secretarial support staff.

Review Process

The IA quality improvement meeting should occur at least quarterly, and, depending on volume, may need to occur more frequently to provide adequate assessment and review. The number of IA revascularization cases at a given institution is generally not of such magnitude as to preclude a review of every case, regardless of outcome. All endovascular stroke cases should be reviewed, and, as noted earlier in the section on data collection, entered into a trial, database, or registry with national participation.

The interventionist who performed the specific case under review should be present to offer his/her observations and perspective. The focused IA peer review should routinely include assessment of technical factors such as device choice, supplemental lytic infusion parameters, and equipment inventory assessment. Process elements such as on-call notification, response time, procedure table setup, and overall communication should also receive routine attention. It is also the role of the IA quality improvement review to assure that regular interventional support personnel receive routine in-services. Performance review is not limited to the treating endovascular physician, but should also include personnel from the emergency department and neurology and neurointensive care units; interventional technologists; nursing staff; and personnel from other related service areas as indicated.

Triggers for Review

Any event that might affect quality should be reviewed. Specific triggers for IA review include unmet process benchmarks, death, and symptomatic postprocedure hemorrhage. Some complications or process delays may be unavoidable, whereas others may reflect significant errors in judgment or process deficiencies. A determination must be made if the patient was harmed. Process problems such as delays or inadequate communication increase the risk of harm. Therefore, complications and events that increase the risk of poor outcomes need to be reviewed as a means of improving quality. There must also be differentiation between clearly procedure-related complications such as perforation and/or dissection, distal dislodgment of thrombus that remains unreachable, air embolus, embolus to a previously unaffected territory, and immediate SICH following the procedure from those that might be related to the primary ischemic event itself such as infarction, cerebral edema, and hemorrhagic transformation. Predisposing underlying vascular disease and comorbidities must also be considered.

Physicians who choose to treat sicker patients may have poorer outcomes and may not meet established benchmarks. These cases should not be considered in isolation, as a poor outcome does not necessarily indicate that such physicians are providing a lower quality of care, but rather that they have a different patient mix from the trials that were used to create the benchmarks. IA quality improvement case review triggers and key process metrics are summarized in Table 3 in the original guideline document.

In addition to these morbidity and mortality markers, it is incumbent on the institution and the quality assurance/improvement and peer-review committee to also assess the "good outcomes." A certain percentage of good outcomes are necessary for there to be sufficient benefit to the overall patient population. This document also defines minimal recanalization rates as well as improved clinical outcomes that should be attained.

Performance and Process Improvement

The committee should be equipped to deal with poor performance in a supportive, constructive, and collegial manner. In cases in which negative trends and deficiencies become apparent, improvement may require one-on-one mentoring, additional education, or supplemental training. IA stroke quality improvement review of problematic cases should generate a specific course of action to remedy recognized problems and prevent future occurrences. Individual assignments should be tracked with accountability reports scheduled for subsequent meetings. In addition, process improvement is a continuing activity that, along with individual performance improvement, will significantly impact clinical outcomes.

Clinical Algorithm(s)

None provided

Scope

Disease/Condition(s)

Acute ischemic stroke

Guideline Category

Management

Risk Assessment

Treatment

Clinical Specialty

Emergency Medicine

Internal Medicine

Neurological Surgery

Neurology

Radiology

Surgery

Intended Users

Advanced Practice Nurses

Emergency Medical Technicians/Paramedics

Nurses

Physician Assistants

Physicians

Guideline Objective(s)

- To define quality benchmarks for processes of care and clinical outcomes in acute stroke revascularization
- To assess and improve processes and outcomes in acute stroke revascularization

Target Population

Patients with acute ischemic stroke undergoing endovascular treatment with intraarterial thrombolytic agents or mechanical revascularization

Interventions and Practices Considered

1. Data collection (age, sex, race, National Institute of Health Stroke Scale [NIHSS], location of occlusion, various time points and intervals, blood pressure, presence or absence of diabetes, presence or absence of atrial fibrillation, and type of occlusion)
2. Key time intervals
    - Door to imaging
    - Use of computer tomography (CT) angiography/perfusion or magnetic resonance (MR) imaging/angiography as first-step imaging
    - Door to puncture
    - Puncture time to start of revascularization
    - Puncture time to revascularization
3. Outcome metrics
    - Recanalization and reperfusion measures
    - Postprocedure CT/MR
    - Occurrence of symptomatic intracerebral hemorrhage
    - Clinical outcomes
    - Occurrence of death within 72 hours
4. Quality improvement
    - Peer review team
    - Review process
    - Triggers for review
    - Performance and process improvement

Major Outcomes Considered

- Recanalization/reperfusion rate
- Modified Rankin Scale (mRS) score (clinical outcome measure)

- Incidence of symptomatic intracerebral hemorrhage (SICH)
- Death within 72 hours of treatment
- Procedure-related complications
- Mortality

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

A literature search was performed using PubMed based on article titles from 1986 to September 2010 (all languages) that included the word "stroke" plus any one of the following words: "intraarterial," "endovascular," "revascularization," "concentric," or "penumbra." Additional articles were then solicited from writing group members. The evidence table was updated using the same search terms, as well as the additional search terms of "stentriever, Trevo, or Solitaire" in February 2012 at the time of completion of the draft of the document to allow updating of the metrics, if appropriate.

Number of Source Documents

Not stated

Methods Used to Assess the Quality and Strength of the Evidence

Not stated

Rating Scheme for the Strength of the Evidence

Not applicable

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

An evidence table (see the "Availability of Companion Documents" field) was constructed using articles that included at least 25 patients. From the evidence table metrics were chosen that were felt to be important markers of quality of care. Thresholds for metrics were then chosen by consensus of the writing group based on review of the evidence table. The evidence table was then updated using the same search terms, as well as additional search terms (see the "Description of Methods Used to Collect/Select the Evidence" field) at the time of completion of the draft of the document to allow updating of the metrics, if appropriate.

Methods Used to Formulate the Recommendations

Expert Consensus (Delphi)

Description of Methods Used to Formulate the Recommendations

Members of the writing group were appointed by the American Society of Neuroradiology, Canadian Interventional Radiology Association, Cardiovascular and Interventional Radiological Society of Europe, Society of Cardiac Angiography and Interventions, Society of Interventional Radiology, Society of NeuroInterventional Surgery, European Society of Minimally Invasive Neurological Therapy, and Society of Vascular and Interventional Neurology. The writing group reviewed the relevant literature from 1986 through February 2012 to create an evidence table summarizing processes and outcomes of care. Performance metrics and thresholds were then created by consensus.

From the evidence table, metrics were chosen that were believed to be important markers of quality of care. Thresholds for metrics were then chosen by consensus of the writing group based on review of the evidence table.

Rating Scheme for the Strength of the Recommendations

Not applicable

Cost Analysis

The guideline developers reviewed published cost analysis.

Method of Guideline Validation

Not stated

Description of Method of Guideline Validation

Not applicable

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of evidence supporting the recommendations is not specifically stated.

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Improved quality of intraarterial catheter-directed treatment of acute ischemic stroke

Potential Harms

- The most common major risk of endovascular treatment of acute ischemic stroke is symptomatic intracerebral hemorrhage (SICH). The reported incidences of SICH (as defined by individual studies) following intraarterial (IA) revascularization range from 5% to 12%, with an average of approximately 10% in a metaanalysis of randomized trials.
- Subarachnoid hemorrhage is a unique complication of endovascular therapy, and is not typically seen with intravenous (IV) therapy with tissue plasminogen activator (tPA) alone. Intraprocedural subarachnoid hemorrhage can be rapidly fatal and is typically technique-related, and is therefore an entity that deserves special scrutiny.
- Other procedure-related complications include perforation and/or dissection, distal dislodgment of thrombus that remains unreachable, air

embolus, and embolus to a previously unaffected territory.

Contraindications

Contraindications

Contraindications

- Absolute contraindications to endovascular treatment based on noncontrast computed tomography (CT) are similar to those for intravenous (IV) thrombolytic agents, and include the presence of acute intracranial hemorrhage or a significant developed infarct. Exclusion criteria that have been reported using advanced imaging include a core infarct larger than 100 cm^3, and penumbra less than 20% larger than the core infarct.
- There are numerous relative contraindications to stroke revascularization, including recent head trauma, myocardial infarction (MI), gastrointestinal/genitourinary bleeding, arterial punctures in noncompressible sites, recent surgery, uncontrollable hypertension, international normalized ratio greater than 1.7, platelet count lower than 100,000, seizure at stroke onset, and very low or high blood glucose levels. Because of the ability to use no or low doses of thrombolytic agent, the strong or absolute contraindications for IV lytic agent use in view of the risk of systemic bleeding are only relative contraindications for IA therapy. However, compared with IV treatment, IA treatment poses a consistently higher risk of symptomatic intracerebral hemorrhage (SICH), which may be secondary to more effective reperfusion of infarcted brain. Diabetes and atrial fibrillation have also been associated with worse outcomes.

Qualifying Statements

Qualifying Statements

Qualifying Statements

A primary goal of the Society of Interventional Radiology (SIR) is ensuring high-quality outcomes and patient safety in vascular and interventional radiology. The clinical practice guidelines of the Society of Interventional Radiology attempt to define practice principles that generally should assist in producing high quality medical care. These guidelines are voluntary and are not rules. A physician may deviate from these guidelines, as necessitated by the individual patient and available resources. These practice guidelines should not be deemed inclusive of all proper methods of care or exclusive of other methods of care that are reasonably directed towards the same result. Other sources of information may be used in conjunction with these principles to produce a process leading to high quality medical care. The ultimate judgment regarding the conduct of any specific procedure or course of management must be made by the physician, who should consider all circumstances relevant to the individual clinical situation. Adherence to the SIR Quality Improvement Program will not assure a successful outcome in every situation. It is prudent to document the rationale for any deviation from the suggested practice guidelines in the department policies and procedure manual or in the patient's medical record.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

IOM Domain

Effectiveness

Timeliness

Identifying Information and Availability

Bibliographic Source(s)

Sacks D, Black CM, Cognard C, Connors JJ III, Frei D, Gupta R, Jovin TG, Kluck B, Meyers PM, Murphy KJ, Ramee S, RÃ¼fenacht DA, Stallmeyer MJB, Vorwerk D, American Society of Neuroradiology, Canadian Interventional Radiology Association, Cardiovascular and Interventional Radiological Society of Europe, Society for Cardiovascular Angiography and Interventions, Society of Interventional Radiology, Society of NeuroInterventional Surgery, European Society of Minimally Invasive Neurological Therapy, Society of Vascular and Interventional Neurology. Multisociety consensus quality improvement guidelines for intraarterial catheter-directed treatment of acute ischemic stroke, from the American Society of Neuroradiology, Canadian Interventional Radiology Association, Cardiovascular and Interventional Radiological Society of Europe, Society for Cardiovascular Angiography and Interventions, Society of Interventional Radiology, Society of NeuroInterventional Surgery, European Society of Minimally Invasive Neurological Therapy, and Society of Vascular and Interventional Neurology. J Vasc Interv Radiol. 2013 Feb;24(2):151-63. [142 references] PubMed

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2013 Feb

Guideline Developer(s)

American Society of Neuroradiology - Professional Association

Canadian Interventional Radiology Association - Medical Specialty Society

Cardiovascular and Interventional Radiological Society of Europe - Nonprofit Organization

European Society of Minimally Invasive Neurological Therapy - Professional Association

Society for Cardiovascular Angiography and Interventions - Medical Specialty Society

Society of Interventional Radiology - Medical Specialty Society

Society of NeuroInterventional Surgery - Medical Specialty Society

Society of Vascular and Interventional Neurology - Medical Specialty Society

Source(s) of Funding

Society of Interventional Radiology

Guideline Committee

Standards of Practice Committee

Composition of Group That Authored the Guideline

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Financial Disclosures/Conflicts of Interest

C.C. is a consultant for Stryker, MicroVention, Covidien and Codman. D.F. is a consultant for MicroVention and is a shareholder and receives funding from Penumbra. R.G. is a consultant for Stryker, Covidien, and Reverse Medical. None of the other authors have identified a conflict of interest.

Guideline Status

This is the current release of the guideline.

Guideline Availability

Electronic copies: Available from the Society of Interventional Radiology Web site.

Print copies: Available from the Society of Interventional Radiology, 10201 Lee Highway, Suite 500, Fairfax, VA 22030

Availability of Companion Documents

An evidence table (Appendix) is available online at the Journal of Vascular and Interventional Radiology Web site.

Patient Resources

None available

NGC Status

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